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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/088,975	08/13/2002	Thomas L Ritzdorf	SEMT118781	6706
26389 7590 09/21/2007 CHRISTENSEN, O'CONNOR, JOHNSON, KINDNESS, PLLC 1420 FIFTH AVENUE SUITE 2800 SEATTLE, WA 98101-2347			EXAMINER LEADER, WILLIAM T	
			ART UNIT 1753	PAPER NUMBER
			MAIL DATE 09/21/2007	DELIVERY MODE PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

# Office Action Summary

Application No.

10/088,975

Applicant(s)

RITZDORF ET AL.

Examiner

William T. Leader

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 03 July 2007.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1,3-5,7,8,11-15,17-22,24-26 and 28-39 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1,3-5, 7,8, 11-15,17-22,24-26 and 28-39 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

## Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

## Attachment(s)

- ☒ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☐ Information Disclosure Statement(s) (PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_
- ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_
- ☐ Notice of Informal Patent Application
- ☐ Other: \_\_\_\_\_

### DETAILED ACTION

1. Receipt of the papers filed on July 3, 2007, is acknowledged. Claims 1, 3-5, 7, 8, 11-15, 17-22, 24-26 and 28-39 are pending.
2. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

### *Claim Rejections - 35 USC § 103*

1. Claims 1, 3-5, 7, 8, 11-15, 17-22, 24-26, 28-31, 33-37 and 39 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dubin et al (5,972,192) combined with Ueno (6,245,676) and Ding et al (6,328,871) and further in view of in view of Sonnenberg et al (5,223,118) and Creutz (3,770,598) for the reasons of record and in view of the following comments.
2. Claim 32 is rejected under 35 U.S.C. 103(a) as being unpatentable over Dubin et al (5,972,192) combined with Ueno (6,245,676) and Ding et al (6,328,871) and further in view of in view of Sonnenberg et al (5,223,118) and Creutz (3,770,598) as applied to claims 1, 3-5, 7, 8, 11-15, 17-22, 24-26, 28-31, 33-37 and 39 above, and further in view of in view of Ting et al (5,969,422) for the reasons of record and in view of the following comments.
3. Claim 38 is rejected under 35 U.S.C. 103(a) as being unpatentable over Dubin et al (5,972,192) combined with Ueno (6,245,676) and Ding et al (6,328,871) and further in view of in view of Sonnenberg et al (5,223,118) and Creutz (3,770,598) as applied to claims 1, 3-5, 7, 8,

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11-15, 17-22, 24-26, 28-31, 33-37 and 39 above, and further in view of Uzoh et al (6,251,251) for the reasons of record and in view of the following comments.

4. Claims 1, 3-5, 7, 8, 11-15, 17-22, 24-26, 28-31 and 39 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dubin et al (5,972,192) combined with Ding et al (6,328,871) and further in view of in view of Sonnenberg et al (5,223,118) and Creutz (3,770,598) for the reasons of record and in view of the following comments.

5. Claim 32 is rejected under 35 U.S.C. 103(a) as being unpatentable over Dubin et al (5,972,192) combined with Ding et al (6,328,871) and further in view of in view of Sonnenberg et al (5,223,118) and Creutz in view of in view of Ting et al (5,969,422) for the reasons of record and in view of the following comments.

6. Claim 38 is rejected under 35 U.S.C. 103(a) as being unpatentable over Dubin et al (5,972,192) combined with Ding et al (6,328,871) and further in view of in view of Sonnenberg et al (5,223,118) and Creutz in view of Uzoh et al (6,251,251) for the reasons of record and in view of the following comments.

7. Applicant has amended independent claims 1, 24, 25, 26 and 28 to recite that the organic additive comprises an accelerator agent. The claims are not considered to distinguish on this basis. In example 1, Dubin et al '192 discloses the use of a plating solution which includes a brightener and a leveling agent, but does not use the term "accelerator". However, it is recognized in the art that the terms "brightener" and "accelerator" refer generally to the same compounds. Thus, while one reference may call an additive a brightener, another reference may

call the same additive an accelerator. This is illustrated by Ding et al (6,348,871), newly cited. The Ding et al patent is directed to electroplating to fill sub-micron features such as interconnects in semiconductor device fabrication (column 1, lines 14-22). Ding refers to additives used in copper plating solution as suppressers and "brighteners/accelerators", thus indicating that the terms "brightener" and "accelerator" are used synonymously. Applicant's claim 17 recites that the accelerator agent includes the chemical structure  $S-R_1-S$ , wherein  $R_1$  comprises an alkyl or an aryl group. At column 6, lines 5-8, Sonnenberg et al state that "Suitable brighteners useful in the practice of the invention contain the group  $S-R_1-S$ , where  $R_1$  may be an alkyl or aryl group. Thus, Sonnenberg identified the compounds claimed by applicant as an accelerator agent, as a brightener. Brightener is the term used by Dubin et al. It would have been obvious to have utilized the brightener compounds disclosed by Sonnenberg as the brightener in the process of Dubin et al because they are recognized as being effective in brightening copper deposits. These are the same compounds recited by applicant.

8. Applicant has also added new claim 39 reciting a reverse current density greater than about  $3 \text{ mA/cm}^2$ . In example 2, Dubin discloses anodic (reverse) current density of about  $3 \text{ mA/cm}^2$  to about  $160 \text{ mA/cm}^2$ . Applicant's claimed value falls within this range. Consequently, a claim 39 is considered to be obvious.

9. Applicant's Remarks have been carefully considered but are not deemed to be persuasive. At page 12, applicant argues that Dubin et al fail to teach a time period of greater than or equal to ten seconds. Dubin et al disclose a number of different embodiments for carrying out the invention. In one of the embodiments, after supplying net forward electroplating power to

partially fill the high aspect ratio openings, reverse power is supplied to reduce the thickness of the deposited copper by anodic dissolution to have about the same or smaller copper thickness at the corners of openings than on the side walls. This etching period corresponds to the second time period recited by applicant. Dubin et al do not specify the time required to perform this etching and, thus, are not limited to any particular duration of etching. There is nothing in Dubin et al to suggest that the etching step must be performed in less than 10 seconds. See column 7, lines 1-18. The time periods mentioned in example 1 are taken to represent the time frame in which the process of Dubin et al is carried out and shows that this time frame easily accommodates an etching period of 10 seconds or more. Applicant further argues that there is no suggestion or motivation to combine the teaching of Dubin et al and Ueno. Dubin et al disclose the use of reverse pulse plating for depositing copper to form interconnects on a semiconductor wafer. Ueno similarly is directed to electroplating copper to form interconnects. Dubin et al state that in employing pulse electroplating in accordance with the present invention, one having ordinary skill in the art could easily optimize the relevant variables, such as duty cycle, frequency, and current density. Ueno shows that a pulse time period of 10 seconds for reverse power is known in the art and utilized in the formation of interconnects. In view of the statement by Dubin et al that pulse parameters could be easily optimized, there is nothing unexpected in the use of the reverse power time period of 10 seconds as recited by applicant.

10. Instant claims 28-31, 37 and 38 are directed to apparatus. As explained by MPEP 2114, the manner of operating the device does not differentiate an apparatus claim from the prior art.

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Thus, the time periods used for carrying out the different process steps recited by applicant are not effective to distinguish claims directed to apparatus.

11. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to William T. Leader whose telephone number is 571-272-1245. The examiner can normally be reached on Mondays-Thursdays and alternate Fridays, 7:30-4:00.


If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Susy Tsang-Foster can be reached on 571-272-1293. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.



William Leader  
September 12, 2007



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PRIMARY EXAMINER